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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,223	12/15/2003	Patrick Moller	10760.0001-00000	8649

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EXAMINER	
VAN, LUAN V	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/734,223	MOLLER ET AL.	
	Examiner	Art Unit	
	LUAN V. VAN	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 June 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *72-99* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *72-99* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's amendment of June 23, 2009 does not render the application allowable. Claims 72-99 are pending in the application.

Status of Objections and Rejections

All rejections from the previous office action are maintained.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 80, 82-84, 97, and 99 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Regarding claim 80, the claim recites cleaning by either "electrochemical etching" or "local electrochemical cell". Cleaning by an electrochemical method is not supported by the applicant's specification.

Regarding claim 82, the claim recites that the **substrate** is chosen from a group of metals such as stainless steel, platinum, etc., however, this limitation is not supported by the applicant's specification.

Regarding claim 83, the recitation of "a **semiconductor structure is formed on** the electrically conductive surface of the substrate" is not supported by the specification.

Regarding claim 84, the recitation of "**a conductive polymer structure is formed** on the electrically conductive surface of the substrate" is not supported by the specification.

Regarding claim 97 and 99, the recitation of plating on "multiple electrically conductive substrates" is not supported by the specification.

The limitations in these claims are deemed to be new matter, because they are not supported by the applicant's specification.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 72-78, 81, 82, 85, 93, 94 and 96-99 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen ‘369 (US patent 6475369).

Regarding claim 72 and 98, Cohen ‘369 teaches a method for creating structures in an electrically conductive surface of a substrate, comprising: providing a master electrode 4 (Fig. 11), the master electrode for receiving soluble anode material (the master electrode is inherently capable of receiving a soluble material since it is

electrically conductive and is structurally capable of receiving the material), the master electrode having an electrically conductive surface 8 (Fig. 1-2, 11b, column 4 lines 56-63 states that the support 8 can be an anode, and that the anode can be insoluble, see column 7 line 49) less soluble than the soluble anode material and an insulating pattern layer 6 arranged directly on the less soluble surface 8 (as seen in Fig. 11b), the insulating pattern layer 6 cooperating with the less soluble surface to define at least one cavity substantially devoid of soluble anode material (Fig. 11b); bringing the master electrode in close contact with the electrically conductive surface of the substrate (column 5 lines 4-6); and plating (column 13 lines 40-59) a pattern on the substrate by electrochemically transporting, through an electrolyte solution, soluble anode material (e.g., in the solution) in the cavity to the electrically conductive surface of the substrate.

With respect to the depositing step, Cohen teaches that in the embodiment of a soluble anode having an erodable layer supported by a conductive material that does not erode (column 7 lines 50-52), the erodable layer is redressed, i.e. deposited, periodically by reversing the polarity of the anode and plating back onto the anode of the negative features of the mask (column 7 lines 54-57). In addition, Cohen teaches that the "[u]niform plating can also be achieved by use as support an insoluble anode having a thin layer of a soluble coating **having a thickness calculated to provide the desired thickness of plated metal on the substrate. Once the finite amount of ions in the volume of electrolyte within the area defined by the mask, the coating and the substrate are plated, plating ceases.** As long as the coating is uniform in thickness, the plated metal will be uniform in thickness." (Column 15 lines 28-35).

Cohen differs from the instant claims in that the reference does not explicitly teach whether a material is deposited within the features of the mask when the insoluble anode is used.

Since Cohen teaches that a soluble material can be deposited or plated onto the anode of the negative features of the mask (column 7 lines 54-57), one having ordinary skill in the art would envision that a soluble material can be deposited onto either a soluble or insoluble anode in order to redress or deposit additional material within the features as it would involve the same process. In addition, the instant claims do not specify what the soluble or less soluble material is, therefore an anode material, even though it may be eroded during the electroplating process, would be less soluble than the anode material in the solution since it is a solid before it is being consumed. While it is understood that an insoluble anode does not need to be redressed since it does not erode during the plating step, Cohen suggests that when using an insoluble anode a finite amount of soluble material can be formed within the cavity defined by the mask in order to improve the uniformity of the plated material (column 15 lines 28-35). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have deposited a finite amount of soluble material within the cavity defined by the mask in order to improve the uniformity of the plated material, as suggested by Cohen (column 15 lines 28-35).

Regarding claim 73, Cohen ‘369 teaches wherein the first material is chemically inert in the electrolyte solution used because the first material "does not erode" (column 7 lines 49-52).

Regarding claims 74 and 75, Cohen ‘369 teaches further including connecting an external plating voltage in such way that the substrate becomes the cathode and the master electrode becomes the anode in local electrochemical plating cells, the plating cells being defined by the at least one cavity in the master electrode, in which cavity the anode material has been pre-deposited (Fig. 11b).

Regarding claim 76, Cohen ‘369 teaches that the "anode can be ‘redressed’ periodically by reversing the polarity of the anode and plating metal back onto the anode through the negative features of the mask" (column 7 lines 54-57).

Regarding claims 77 and 78, Cohen '369 teaches further including applying an external etching voltage in such way that the substrate becomes the anode and the master electrode becomes the cathode in the local electrochemical etching cell, the cell being defined by the cavity in the master electrode (column 26 line 7-15).

Regarding claims 81 and 82, Cohen ‘369 teaches that the substrate to be plated functions as the cathode (column 4 lines 50-52), and that the substrate to be plated can include a conductive surface or a nonconductive surface provided with the conductive layer. Further, the substrate to be plated can also be a previously electroplated or deposit metal or a layer that includes at least one metal (column 14 lines 53-58). Since copper and nickel is the electroplated on the substrate to form the three-dimensional structure in the method of Cohen ‘369, this teaching reads on claims 81 and 82.

Regarding claim 85, Cohen ‘369 teaches pulsing the plating current (column 20 lines 13-29).

Regarding claims 93 and 94, Cohen '369 differs from the instant claims in that the reference does not explicitly teach the concentrations of supporting electrolyte and chemical oxidation agent (claim 93), or counter ions (claim 94). Regarding claim 93, Cohen '369 does not discuss the electroplating bath in detail, and thus do not mention a supporting electrolyte or chemical oxidation agent. It would have been obvious to one having ordinary skill in the art to have omitted these components in a conventional electroplating bath since the metals in Cohen '369 can be plated successfully without them. Regarding claim 94, it would have been obvious to one having ordinary skill in the art to have expected that the counter ions in the electrolyte solution of Cohen '369 are exchanged to ones which provide higher solubility, because Cohen '369 uses the same electrolytic process and solution as that of the instant invention.

Regarding claim 96, the electrolyte of Cohen '369 is an optimized electrolyte.

Regarding claims 97 and 99, Cohen '369 teaches that the substrate to be plated can include a conductive surface or a nonconductive surface provided with the conductive layer. Further, the substrate to be plated can also be a previously electroplated or deposit metal or a layer that includes at least one metal (column 14 lines 53-58). Therefore, Cohen '369 suggests that different substrates can be used. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have plated a pattern on multiple substrates, because it would enable the fabrication of more than one device. Further, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have emptied the cavity of

a soluble anode material in the method of Cohen '369, because reduce the frequency of replenishing the soluble anode material.

Claims 83 and 84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen '369 in view of Tatsuura et al. (US patent 5961806).

Cohen '369 teaches the method as described above. Cohen '369 differs from the instant claims in that the reference does not explicitly teach forming a semiconductor or conductive polymer structure.

Tatsuura et al. teaches: "Materials of the electrode substrate on which the electrodeposition layer is formed are not specifically limited and may be selected from various electrically conductive materials including metals and organic or inorganic **semiconductors**, or their vapor deposition films. Noble metals such as platinum and gold or carbon which are highly electrochemically stable are preferably used. The desired color filter may be easily prepared using a transparent substrate such as glass or transparent film and a transparent electrode made of ITO (indium-tin-oxide) or conductive polymer." (Column 5 lines 53-63).

Since Tatsuura et al. teach that electrodeposition can be performed on a variety of substrate materials including a semiconductor and a conductive polymer, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have formed the semiconductor structure or polymer structure of Tatsuura et al. in the method of Cohen, because such structures can be used to build devices having the desired electrical or mechanical properties.

Claims 79 and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen '369 in view of Burnham (US patent 3190822).

Cohen '369 teaches the method as described above. Cohen '369 differs from the instant claims in that the reference does not explicitly teach cleaning and etching the electrode.

Burnham teaches a method of electrolytically etching surfaces of in the valve metal electrodes in order to increase their surface areas so as to make it possible to use relatively small electrodes (column 1 lines 14-18).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cohen '369 by etching the electrode as taught by Burnham, because it would increase the surface area of the electrodes, and because it would remove contaminants from the surfaces of the electrode.

Claims 86-89 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen '369 in view of Tang et al. (US patent 6036833).

Cohen '369 teaches the method as described above. Cohen '369 differs from the instant claims in that the reference does not explicitly teach the specific frequency of the instant claim or periodic pulse reverse.

Tang et al. teach an electroplating method using periodic pulse reverse and a frequency from 100 to 10,000 Hz (column 2 lines 8-9).

Addressing claims 86 and 87, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cohen '369 by using the frequency of Tang et al., because it would produce a more fine-grained and hard plating metal (column 1 lines 33-37 of Tang et al.).

Addressing claims 88 and 89, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cohen '369 by using the periodic pulse reverse of Tang et al., because it would reduce the internal stress of the electrodeposit (column 2 lines 55-60 of Tang et al.).

Claims 90, 91 and 95 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen '369 in view of Scott (US patent 5196109).

Cohen '369 teaches the method as described above. Cohen '369 differs from the instant claims in that the reference does not explicitly teach a sequestering agent or the pH of the instant claim.

Scott teaches an electroplating method and composition using EDTA (column 6 lines 41-61) and a pH of 1.5 to 5.5 (column 6 lines 8-11).

Addressing claims 90 and 91, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cohen '369 by using the sequestering agent of Scott, because it would prolong the useful operating life of the electrolyte necessitating less frequent treatments with precipitating agents or peroxide treatments to remove such harmful metal ions and organic

contaminants when their concentrations increase to objectionable levels (column 6 lines 48-54 of Scott).

Addressing claim 93, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cohen '369 by using the pH range of Scott, because it would increase the conductivity of the electrolyte solution and hence reduce the power consumption required for electrodeposition (column 5 lines 63-65 of Scott).

Claim 92 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen '369 in view of Bernards et al. (US patent 4932518).

Cohen '369 teaches the method as described above. Cohen '369 differs from the instant claims in that the reference does not explicitly teach the additive system of the instant claim.

Bernards et al. teach a composition for electroplating copper onto a conductive surface comprising a solution having brighteners (i.e., accelerators), suppressors, wetting agents, and levelers (column 4 lines 29-55).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Cohen '369 by using additive system of Bernards et al., because it would improve the efficiency of the plating reaction and the quality of the metal deposit (column 1 lines 23-31 of Bernards et al.).

Response to Arguments

Applicant's arguments filed have been fully considered but they are not persuasive. In response to the rejection under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement, the applicant cites parts of the specification to support the amended claims.

Regarding claim 80, the applicant cites on page 18, lines 25-30, disclosing that "it is essential to have an easy way to clean the master electrode. After a number of etching cycles, a cleaning process is normally performed. The deposit material 13 is etched away from the 30 master electrode 8." Further, "electrochemical etching" finds support in the specification elsewhere. The examiner notes that this is not equivalent to the limitation of "the cleaning process includes electrochemical etching". The fact that the specification teaches cleaning and electrochemical etching elsewhere does not support the limitation of cleaning by electrochemical etching.

Regarding claim 82, the applicant points to page 12, lines 22-25, to provide support for the claim. However, it is noted that the material listed is directed to the material of the electrode layer **and not of the substrate**. While this supports the limitation of the electrode being chosen from the list of materials, the limitation of the **substrate** is chosen from a group of metals such as stainless steel, platinum, etc., however, is not supported by the applicant's specification.

Regarding claims 83 and 84, the applicant points to page 1, lines 17-22, of the specification to provide support for the instant claims. The specification discloses:

> The method is particularly useful for fabrication of PWB (printed wiring boards), PCB (printed circuit boards), MEMS (micro electro mechanical systems), sensors, flat panel display, magnetic and optical storage devices. Integrated circuits, different types of structures in conductive polymers, structures in semiconductors, structures in metals, and

> others are possible to produce using this method. Even 3D-structures in silicon, by using formation of porous silicon, are possible.

While this discusses different types of **structures in conductive polymers and semiconductors** are possible to produce using the method, it does not support specifically the recitation of "a **semiconductor structure is formed on** the electrically conductive surface of the substrate" nor the recitation of "**a conductive polymer structure is formed** on the electrically conductive surface of the substrate".

Regarding claim 97 and 99, the applicant points to a various places within the specification to indicate support for the instant claims. However, nowhere in the specification is the recitation of plating on "multiple electrically conductive substrates" supported by the specification. The fact that a process may be repeated multiple times does not support using multiple substrates.

In response to the rejection of claim 72 under 35 USC 103(a) over Cohen, the applicant argues that while Cohen teaches using a soluble and insoluble anode, Cohen does not teach arranging the conformable mask directly on the insoluble anode. The examiner respectfully disagrees. Cohen, on column 7, lines 48-52, discloses "**[t]he electroplating article can consist of a patterned mask on an anode. The anode can be soluble or insoluble**, rigid or flexible, porous or nonporous, and **can** include an erodable layer (e.g., a metal layer) supported by a conductive material that does not erode (e.g., platinized titanium)." Therefore, since Cohen teaches that electroplating article consists of a patterned mask on an anode and that the anode can be insoluble, Cohen clearly suggests that the mask is arranged directly on the insoluble anode. The embodiment of an erodible layer supported by an inert material is simply an optional

embodiment of the anode since Cohen teaches that the anode "can include" that configuration.

Furthermore, Cohen teaches that the "[u]niform plating can also be achieved by use as support an insoluble anode having a thin layer of **a soluble coating having a thickness calculated to provide the desired thickness of plated metal on the substrate. Once the finite amount of ions in the volume of electrolyte within the area defined by the mask, the coating and the substrate are plated, plating ceases.**" (Column 15 lines 28-35). While it is understood that an insoluble anode does not need to be redressed since it does not erode during the plating step, Cohen suggests that when using an insoluble anode a finite amount of soluble material can be formed within the cavity defined by the mask in order to improve the uniformity of the plated material (column 15 lines 28-35). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have deposited a finite amount of soluble material within the cavity defined by the mask in order to improve the uniformity of the plated material, as suggested by Cohen (column 15 lines 28-35).

Conclusion

THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LUAN V. VAN whose telephone number is (571)272-8521. The examiner can normally be reached on M-F 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

LVV
September 10, 2009